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Transformational Development of Speed-Reading Technology: Tools, Machines and Software Applications

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***Abstract*—This conceptual paper aims to concentrate on the transformational development of tools, machines, and software applications used to increase the speed of reading. There has been a need for modernization of the old-fashioned machines in the field of speed reading. Several practical steps have already been taken in the last three decades of the twentieth century, and several outdated speed-reading tools and various equipment types have already been replaced by quite a few speed-reading software programs and mobile applications. The earliest speed-reading tools are reading pacing machines, which work on various simple to advanced technological principles. Different types of machines are also used for tracking the movements of eyes in the form of saccades and fixations during reading. Subsequently, several speed-increasing software tools use the powerful text processing technique called the Rapid Serial Visual Presentation (RSVP). Many of these tools have demonstrated significant productivity gains in the reading speed of learners. However, this transformational development has resulted in a multiplicity of speed-increasing function-specific software applications, there remains a need to choose the right combination of them, considering the diversity among learners and their goals. Though the distance covered in this journey of transformational development of tools, machines and software applications is quite encouraging, there is still room for improvements in terms of making the process of speed reading closer to natural reading.**

***Index Terms*—speed reading, software, applications, reading comprehension, reading speed**

I. Introduction

The research in the field of speed reading started as early as the beginning of the 20th century. Stone and Colvin (1920) trained 45 students for 35 hours in study skills, with an increase of 74 per cent in their reading speed. Two years later, Stone (1922) again recorded an average increase of 35 to 108 per cent in his undergraduates' reading speed who received full training of 35 hours, focusing exclusively on their reading speed. Lauer (1936), while making a further breakthrough in the field of speed reading, concluded that his sample of 355 undergraduates could increase their normal reading speed from an average of 248 words per minute to a higher level of 325.5 words per minute. It amounts to a 35 per cent increase, and that too after only 20 speed increasing training sessions. However, all these research studies focus on the speed of reading alone, and the tools used for this increase were not given primary attention.

II. Objectives of the Study

The main focus of all speed-reading studies has been on the results, either the increased speed or the enhanced comprehension. The tools and machines used to increase reading speed have never been given primary focus of attention. In order to fill this gap in the speed-reading literature, the present study aims:

- To track the transformational development of the tools and machines used for increasing the speed of reading.

- To track the transformational development of the software programmes and mobile applications used for increasing the speed of reading.

III. Methodology

This paper utilises library search as the methodology and scrutinises previous literature published on the subject of Speed Reading. The library search involves both offline and online materials in the form of journal articles, books and chapters in the books. References are in accordance with online research databases such as Google Scholar, Web of Science, Science and Direct Scopus. The advanced search is limited to ‘tools’, ‘machines’, ‘software’, and ‘mobile applications’ within the sphere of speed reading. References are taken from the literature in this domain published during the past five decades.

This article, stemming from the knowledge-based viewpoint, has planned to collect data from the target literature about three evolutionary phases of speed-reading technology: old-fashioned tools, advanced machines and up-to-date software applications.

IV. The Speed-Reading Mechanisms

The machines and tools used for the achievement of the general purpose of increasing the speed of reading, in reality, serve various specific functions. Therefore, before moving to the main study, it is necessary to have a bird's eye view of various sub-processes culminating into the core domain of speed reading.

Speed reading courses mainly apply a two-pronged strategy for the realization of their objectives: first, they eliminate different kinds of obstacles that slow down the reading speed; and, secondly, they increase the speed of reading with the help of various valuable mechanisms. A brief overview of the strategies to eliminate obstacles to speed reading and increase the speed of reading is given below:

A. Elimination of Subvocalisation

The first barrier to speed reading is the habit of sub-vocalization. In the initial years at school, when the students first begin learning how to read, they are advised to say the words aloud and let the teacher correct their pronunciation mistakes. However, unfortunately, they continue to say words out loud while reading later in practical life. Over time, though they do not speak the words aloud, they still "read out loud" in their heads, a phenomenon referred to as 'subvocalization (Cutler, 2002; Beale & Mullan, 2008). Speaking has a physical limit beyond which one cannot talk intelligibly. Sub-vocalisation, a silent form of speaking, keeps the reading rate within the limit of around 150 words per minute.

B. Stopping Regression

The act of reading is primarily based on the input of written text received through the eyes. During reading for an average reader, the eyes typically move forward with the upcoming text. These movements of eyes are always not in the forward direction only, but at times, the eyes move back to re-read the previously read words or sentences, which ultimately slows down the overall act of reading. To stop this wasteful habit of regression, Cutler (2002) suggests using a piece of cardboard to cover the preceding lines instantly. However, it is recommended to use this practice in the early stages of speed reading only and may better be stopped after the skill of smooth forward reading is mastered. The advanced speed-reading level needs to let the eyes visualize the complete page un-obstructively.

C. Pacing [Meta-Guiding]

Similarly, the forward movements of eyes during reading adopt a specific speed that may psychologically be considered 'a fixed habit' as a result of which the speed of reading also gets fixed at a specific limit. In order to increase the speed of reading, it is essential to remove this limitation by using a physical pacer like a finger or a pencil to move across the line at a faster pace and make the eyes follow it meticulously. According to Cutler (2002), the only good direction for the eyes during reading is forward and down the page.

D. Chunking up

'Chunking up' is a speed-increase strategy that, in the words of Smith (2004), is the phenomenon of "storing the largest meaningful unit in short-term memory". It offers a functional solution to the limited capacity of short-term memory. 'Chunking down' suggests coming down to smaller and more specific bits of information, whereas 'chunking up' implies shifting up to the larger, more general chunks of information (O'Connor, 2001). With 'chunking up', the average reader steps up the ladder and reads the same number of words instead of reading certain letters. On the other hand, a fast reader processes an equal number of phrases instantaneously due to chunking up. Kana'an et al. (2014, p. 58) explain that a good reader focuses on chunks of words instead of individual ones. Reading chunk by chunk, according to them, reduces the number of focuses per line as compared to reading word by word and thereby doubles or triples his speed of reading. Chunking up also helps increase comprehension as it organizes the available information into bigger units that are more meaningful.

Moreover, reading in bigger chunks also helps in increasing reading comprehension as the brain, in this case, can more efficiently process the information organized into meaningfully bigger units (Smith, 2004, p. 196). Thus, the level of comprehension of faster readers is higher than that of a slower one.

E. Expansion of Visual Span

Expansion of the visual span is a tool used to increase the speed of reading. The reader is trained to process multiple words in a single eye fixation, resulting in faster reading. A reader with a narrow vision span can read fewer words in one fixation reads slowly. The research on eye movements while reading started at the beginning of the previous century (Secor, 1900; Dearborn, 1906; Huey, 1908). Wood (1966), as a part of her Dynamic Reading programme, trained her readers to expand their span of vision and to read word chunks instead of reading one word at a time and recorded a marked increase in their reading speed. Later, Rayner (1998), as a result of research in eye movements for ten years, observed that the vision span of an average reader might be extended, to the right of the fixation point, by 15 letter spaces and up to 4 to the left (as cited in Smith, 2004).

V. Tools and Machines Used for Increasing the Speed of Reading

If the literature on speed reading is scanned, it is found that several devices have been used for maximizing the EFL learner's efficiency in reading.

A. Reading Pacing Machines

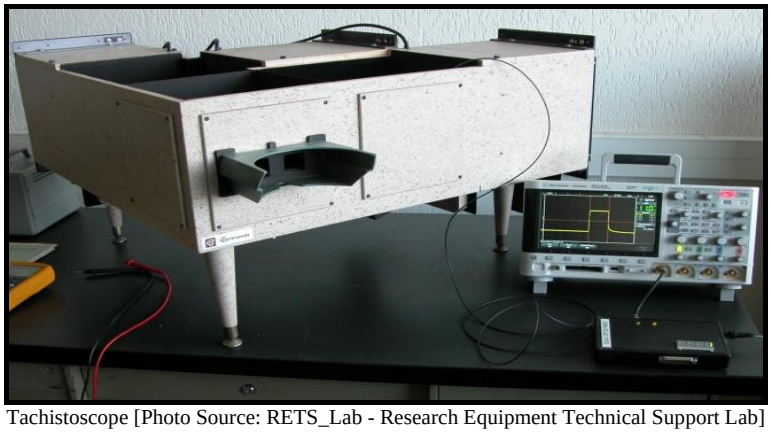
The earliest speed-reading tools are reading pacing machines, which work on various simple to advanced technological principles.

(a). Tachistoscope

A tachistoscope is a specially designed tool used to increase the recognition speed of a picture displayed for a duration of 2 to 0.01 seconds (Goding, 2003, p. 39) in a semi-darkened room. According to him, the word "tachistoscope" is derived from two Greek words: 'tachys' meaning swift, and 'skopion' meaning instrument for viewing or observing. The apparatus is made up of a slide projector and a shutter system of a camera. The commonly used tachistoscope in language laboratories is the TACH-X. It is used to develop the perceptual accuracy of readers in the process of rapid visual presentation. The students are trained for its use in three stages. First, an image is shown for a very short time; secondly, a pause is provided for the learners' response; whereas in the third stage, the same image is exposed for a comparatively long time for the purpose of verification and reinforcement (James, 1970).

Though the tachistoscope is widely used to increase reading speed, it has many conceptual and methodological problems. Ludwig and Polak (1965) have reported several issues related to selecting appropriate stimuli, their construction, and other mechanical difficulties that affect tachistoscopic thresholds.

Presently, the basic tachistoscopes are replaced with various computer software programmes that allow exposures as minute as .001 seconds and many other customizations that may be adjusted for expanding the span of vision (Goding, 2003).



Tachistoscope [Photo Source: RETS_Lab - Research Equipment Technical Support Lab]

(b). Craig-Reader

According to James (1970), the Craig reader is a box-shaped device that displays a 35mm film strip on its TV-like screen. It has a greater span capacity than a tachistoscope by showing linguistic phrases in groups of three to seven words. Furthermore, there is no need for the manipulation required by tachistoscopes as the slide succession process operates automatically with speeds ranging from 150 to 1600 words per minute. The machine de-exposes the preceding line immediately in order to stop the practice of regression. It is portable and can easily be fit on a lab desk. As it is comparatively cheaper, each student can have a separate device in the language lab.

Craig Reader [Photo Source: Recycled Goods, Inc.]

(c). Reading Rateometer

Reading Rateometer is a portable device developed by Audio-Visual Research Inc. Unlike Tachistoscope and Craig Reader, it is closer to the natural reading process in many respects, as no screens and projectors are involved. The previous two machines were criticized because the transfer of training from the artificial to the natural situation is not possible. As it uses normal-format books and typed text papers, it can be used in the classroom in ordinary daylight. In the Rateometer a T-bar moves across the printed page from top to bottom with adjustable speed, and before the text is concealed by the T-bar, the reader tries to read it (James, 1970).

Reading Rateometer [Photo Source: ruten.com.tw]

(d). Salzburg Reading Desk (SRD)

The Salzburg Reading Desk SRD system is a specially designed reading desk used for conducting reading speed and acuity tests on a single device and data gathering tools. It consists of a USB connected DAS (Data Acquisition System) module unit and the main computer. The SRD software, installed on the system, calculates and instantly displays the data about reading acuity, reading distance, reading speed, angle of inclination of the desk, and the illumination of the reading surface. The Reading Charts are mounted on the SRD in the form of a 12-page "textbook". Each chart has 14 sentences (3-14) —the first two pages with larger fonts are omitted, as they are used for testing the reading acuity of low vision patients (Dexl et al., 2010).

The Salzburg Reading Desk SRD system [Photo Source: SLACK Incorporated, PubMed, Dexl et al., 2010]

(e). Colour-Based Technology

It is a technology developed by the BeeLine Reader, as referred to by Rayner et al. (2016, p. 28), and relies on the principle of text colour manipulation for making the process of return sweeps (to the beginning of the following line in a text) convenient and faster (Fig. 1). The application uses a pre-set colouring pattern for different segments of a line. Still, it makes sure that the end of one line and the beginning of the following line have similar colours and shades. Thereby, it helps the reader return to the following line in the text accurately.

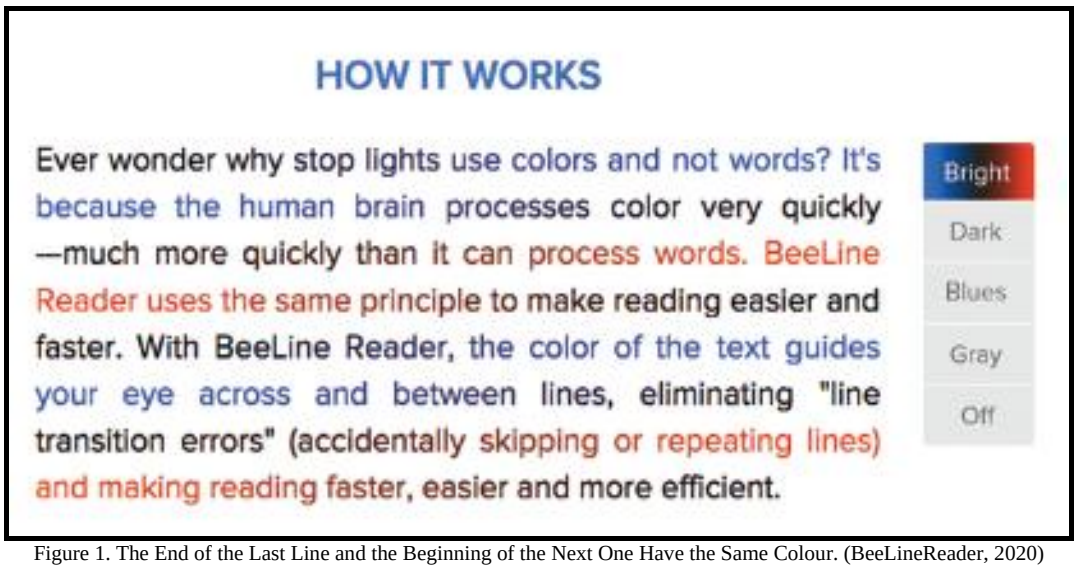


Figure 1. The End of the Last Line and the Beginning of the Next One Have the Same Colour. (BeeLineReader, 2020)

B. Machines/ Tools for Observing Eye-Movements

In almost all the speed improvement models, certain techniques are based on specific movements of the eyes. They include eye fixations on specific points of interest, instances of regressions, and saccades which are rapid eye jumps between fixations (Salvucci & Goldberg, 2000, p. 71). Kliegl et al. (2006) further explain that the range of fixations is between 150 and 300 ms, whereas the saccades last up to 30 ms on average. They found that information uptake happens primarily during fixations.

Initially, to study the reading patterns in the form of saccades and fixations, the researchers directly observed eyes in this field. The use of different machines for tracking the movements of eyes started in the early twentieth century. The technology used at that time was quite invasive, as there was direct contact of different mechanical tools with the eyes, which later around the middle of the twentieth century became less invasive (Boccignone et al., 2014).

During the past decade, researchers primarily in Europe have made efforts to make eye tracking accessible to anyone who has a computer and an infrared camera by providing them with free, open-source software. One such example is GazeTracker – the eye-tracking software developed by GazeGroup. It helps the accurate and easy recording of eye movements during the act of reading. Recently, GazeTracker, with the help of another software OGAMA (Open Gaze

And Mouse Analyzer), facilitates data recording, gaze analysis, statistical analysis and attention mapping. This combination is more than enough to determine in a precise way the strategies and patterns that L2 students use when reading English (Raye, 2013).

For measuring these eye movements, the following types of tracking machines are used:

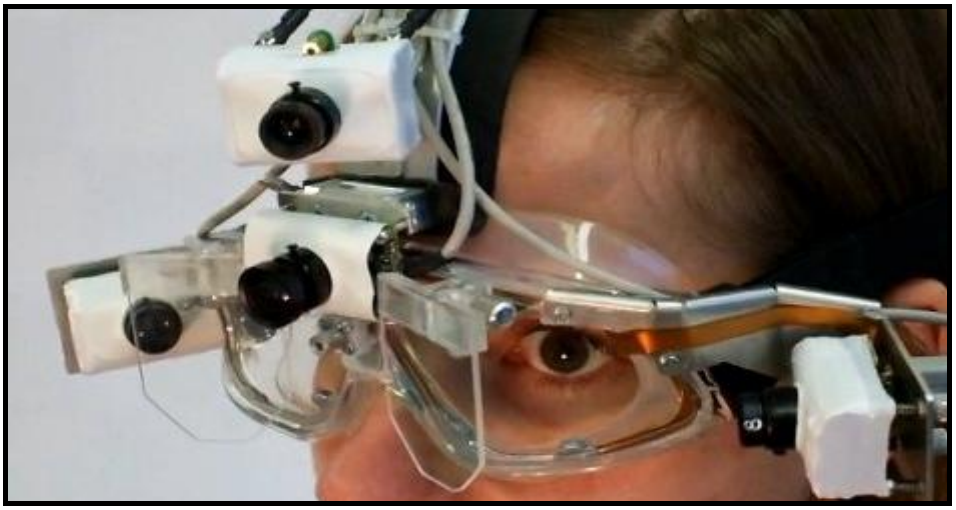
(a). Eye Movement Photography

It is a technique in which an individual reads a text suitable for his achievement level. At the time of reading, tiny beads of light reflected from his eyes are photographed and stored on a moving film. When the reader finishes the text, the recorded film is analyzed for eye fixations, saccades, and regressions (Taylor, 1962).

Other than eye movement photography, Rayner et al. (1998) have mentioned some other types of eye-tracking devices:

(b). Video-Based Tracking Device

Videooculography (VOG) is a video-based tracking system that comes in the form of remote or head-mounted visible light video cameras. They record the readers' eye movements, and the connected computer saves and analyses the visual data thus obtained. Apart from the camera, which records the eye movements, another one records the scene of the visual text. The mismatch between the frame rate and resolution of both cameras may harm the accuracy of tracking data (Majaranta & Bulling, 2014).



Videooculography (VOG) [Photo Source: teusje.wordpress.com]

(c). The Video-Based Infrared Pupil-Corneal Reflection (PCR) Device

The pupil-centred tracking in the VOG (as discussed in the preceding section) may give inaccurate results if there are irregular head movements on the reader's part. To resolve this problem, a reference point, also called 'corneal reflection', needs to be added to the pupil-centred tracking by using an artificial infrared (IR) light source (Barton, 2019). It helps in keeping the eye area illuminated without disturbing the pupil tracking as the IR light is invisible to the human eye (Duchowski, 2017).

The pupil-centred tracking in the VOG [Photo Source: Barton, 2019, slideplayer.com]

(d). Electrooculography-Based Tracking Device

In electrooculography, the human eye is modelled as an electric dipole. One electrode is placed around the eye, whereas the second (reference electrode) is placed on the forehead). The electrical flow across this field is known as the electrooculogram (EOG). When the eyes move towards one of these electrodes, there is a change in the electric field, which is measured for tracking eye movements. There are two types of eye movements: horizontal and vertical, measured in the form of the respective EOG signal component. Unlike video-based eye-tracking, in the EOG, there is minimal impact of changing lighting conditions on the EOG signals— a property that facilitates its use in daily life settings. However, there is a drawback in EOG: it necessitates the attachment of electrodes to the skin around the eyeballs (Majaranta & Bulling, 2014).

Boerding (2016; as cited in Bulling & Gellersen, 2010) has mentioned some other EOG devices: one in which contact lenses are used along with coils to measure the resultant magnetic field, and the other with a mirror plate equipped with a reflecting infrared light source.

Electrooculography-Based Tracking Device [Photo Source: Gallersen - Bulling & Gellersen, 2010]

(e). Oculometer

Oculometer is an intermediary type of eye-tracking device that works closely similar to the modern computer-based eye-tracking systems. Merchant et al. (1974; as cited in Płużyczka, 2018) state that Oculometer was initially made for the US Air Force in 1960. It works on the concept of computer algorithms, in which the system, as shown on its video screen, first recognizes the iris and then determines its geometrical centre, in addition to displaying information about the direction in which the person being tested is looking (Hah et al., 2018).

Oculometer [Photo Source: John Dirico - Hah et al., 2016]

VI. Software Programmes and Mobile Applications Used for Increasing the Speed of Reading

In thinking about 21st-century language learning proficiencies, the use of state-of-the-art technology is recognized as one of the crucial factors (Knobel & Lankshear, 2007, p. 7). For this purpose, the field of speed reading also demanded the modernization of old-fashioned machines. In this connection, several practical steps have already been taken since the last decades of the twentieth century, and several outdated speed-reading tools and various equipment types have already been replaced by quite a few speed-reading software programs and mobile applications.

The software applications mentioned below, to a greater extent, are, directly or indirectly, based on a reading speed increasing technique – the Rapid Serial Visual Presentation (RSVP). Legge et al. (2007) define RSVP as a speed-reading technique where the target text is sequentially presented words by words on a display screen at a fixed location, where the reader concentrates and waits for the next word to show up. RSVP is essentially used for word recognition in reading, but it also helps increase the speed of reading by tapering the visual field and preventing the eyes from moving across the page (Rayner et al., 2016). RSVP has constantly been developed and updated by changing the accurate display of text in various sizes and different breakdown units (Adefila et al., 2020). Many RSVP commercial applications have been recently developed for both Android and Apple platforms.

A. The Accelerated Reader (AR)

It is a speed-increasing software developed by Judi and Terry Paul in 1984 and is distributed by Renaissance Learning, Inc. This program first decides on the learner's current level by giving him a placement test called the Standardized Test for Assessment of Reading (STAR). In the second place, it guides students in selecting texts of a

certain level of difficulty based on their STAR results, and after offering some practice activities for increasing the speed of reading, it finally tests their comprehension level (Li, 2020). However, Johnson and Howard (2003) criticize the software because its evaluation questions test only the literal comprehension of the learners and ignore their inferential reading comprehension check altogether.

B. The Reader's Edge

It is another speed reading and comprehension software developed by the Literacy Company in 2003. Richard Sutz, the founder of the software producing company, has more than 30 years of attachment to the field of speed reading research and has been a personal friend of the speed-reading pioneer, Evelyn Wood (Sutz & Weverka, 2009). The software helps in stopping the habits of slow reading by using computer-generated visual exercises. It develops skilful reading habits through various speed-reading exercises, including mobility training, word group tests, recognition tests, and vertical and horizontal span-expanding exercises (Mark, 2020b).

C. AceReader Pro

AceReader Pro, a speed-increasing computer programme, was developed by StepWare, Inc. This software's model is based mainly on eliminating the speed-reducing practices of subvocalization and backtracking involved in the process of reading (Mark, 2020a). AceReader Pro, unlike The Reader's Edge, has separate versions both for PC and Mac platforms.

D. Speed Your Read

Speed Your Read, a reading-speed-increasing computer program, was developed by Stark Raving Software. The programme consists of various speed-increasing activities, including warm-up exercises, reading drills, speed-increasing tests and timed tests. It creates and keeps the progress reports of multiple users. In the first place, the software detects the current proficiency level of the user and then automatically selects a reading speed suitable for his calibre. However, the field experts criticized the programme for the drawback that it does not offer its user the option to manually adjust the reading speed of his choice.

E. Ultimate Speed Reader

Ultimate Speed Reader, a Knowledge Adventure, Inc. product, is a speed accelerating software (Abdul-Rab, 2022). It contains a collection of about 200 passages and presents six types of speed-increasing exercises. Nevertheless, Ultimate Speed Reader is also not free from structural flaws and is criticized on two bases. First, the collection of built-in reading passages on its platform is not user-friendly, and, secondly, it does not facilitate its users with 'flashing exercises', a necessary practice component offered by other similar software programmes.

F. RocketReader program

RocketReader program, artificial intelligence speed reading software, was developed by Dr Simon Ronald, an Artificial Intelligence researcher, in 1996. This intelligent programme trains the users for reading more rapidly with an improved level of reading comprehension. Rocket Reader teaches self-determination skills to students with disabilities (Rowe et al., 2021).

G. The 7 Speed Reading

The 7 Speed Reading, an eReflect product (eReflect, 2019), is a reading proficiency improvement software that facilitates objective-based training. Its strategies are not the same as the Rapid Serial Visual Presentation (RSVP). It utilizes those techniques which expand the overall region of visual focus. It concentrates on the step-by-step customized guideline suitable for learners of any calibre.

The 7 Speed Reading helps students beat the negative habit of **subvocalization** and make their brains and eyes operate fast and more effectively in the process of speed reading. The second reading impediment that the software removes is the practice of **backtracking** by using some effective techniques explicitly designed to help such readers stop this speed-retarding practice. The software then focuses on increasing the reader's reading pace by helping him read a text in bigger **chunks**, with fewer eye fixations per line, which ultimately increases the speed of reading (Smith, 2004, p. 196). The 7 Speed Reading software, in the next stage, focuses on the **'fixation'**, which means the next series of short stopovers of eyes on specific text, images or words for additional focus. In order to increase the speed of reading, the software decreases the number of fixations per line and makes it easy for the reader to read as many words as possible per eye fixation.

The in-built **library** in the 7 Speed Reading programme includes an extensive collection of more than 20,000 free eBooks on a wide variety of topics (Mark, 2021). Therefore, the learners of different disciplines can practice their speed-reading techniques in the spheres of their specialities. Furthermore, there is a provision to utilize self-uploaded texts to the library so that one can choose the text related to his interest or academic necessities.

H. Spritz

Spritz is a speed-reading application, the novelty of which lies in its blending of the RSVP technique with the Optimal Recognition Point (ORP) system called the Optimal Viewing Position (OVP). The OPR highlights the letter of

a word, which helps the brain to process the meaning efficiently. According to Brysbaert and Nazir (2005), the location of the ORP depends mainly on the length of the word. If a word is long, the eyes must move to the left of its centre to locate the ORP. In the application, all the ORPs are highlighted in red which helps the reader focus on the exact location, leaving no scope for saccades. In this application, longer words are displayed for longer durations, and the sentences have paused after them proportional to length (Benedetto et al., 2015).

VII. Discussions

The current paper has effectively carried out a theoretical review of the literature on the tools, machines and software applications that is valuable for future research in the area of speed reading. Moreover, the study has provided new insight into the field of speed reading and shifted the focus of research from 'the end result' of speed reading to 'the means' of this acceleration in the form of different speed-increasing technological instruments.

In order to materialise this shift and fill the gap in the speed-reading literature, the present study first tracked the trend of development in the tools and machines used for increasing the speed of reading. Unlike the previous speed-reading studies (Agardy, 1981; Berg, 2011; Berger, 1970; Frank, 1994) which only dealt with one tool for increasing the speed of reading, this study, in the first place, evaluated the efficacy of multiple speed-increasing tools, like tachistoscope (Ludwig & Polak, 1965), Craig-reader, reading rateometer (James, 1970), the Salzburg reading desk (Dexl et al., 2010), and colour-based technology (BeeLineReader, 2020).

This study then moved to the second stage and scrutinized the existing speed reading literature for advanced machines used for observing eye movements, such as eye movement photography (Taylor, 1962), video-based tracking devices (Majaranta & Bulling, 2014), the video-based infrared corneal reflection device (Duchowski, 2017), electrooculography-based tracking device (Majaranta & Bulling, 2014) and oculometer (Hah et al., 2018). In the previous studies, though there was an upward trend of technological development, each study dealt with only one machine and there is no literature available on comparing various similar machines or tracking the line of action these technological advancements have undertaken for obtaining better output.

In the next step, this study, unlike the previous studies which never made a comparative assessment of the machines they used, moved its focus from the hardware to software and tracked the development of various software programmes and mobile applications used for increasing the speed of reading. The Accelerated Reader (AR) was among the initial fully developed speed-increasing software of the 1980s which was followed by a more sophisticated application, the Reader's Edge, in the early twenty-first century. It provided digital training for stopping the habits of slow reading in general. Later on, the focus was further zoomed in and the more specific factors of the slow speed—subvocalization and backtracking (Mark, 2020a)—were dealt with by AceReader Pro software, which was not only operational on PC platforms but also on its Mac counterpart. This innovation opened the way for the flood of hi-tech software programmes like Speed Your Read, Ultimate Speed, and RocketReader program (Rowe et al., 2021). All these programmes were, in one way or the other, based on RSVP technology, which was different, in principle, from the natural process of reading. In order to make good this deficiency, the 7 Speed Reading programme was developed by the eReflect company (eReflect, 2019), and was based on a very similar model of natural reading.

In the last step, there is again a great shift in the speed-reading technology and the computer-based software is gradually replaced by mobile applications, the best example of which is Spritz (Benedetto et al., 2015). Presently there is a mushroom growth of similar apps in both Google Play (Android) and the App Store (iOS) which has brought a complete revolution in the field of educational technology, especially the speed-reading domain.

VIII. Conclusion

The findings of this study prove that the domain of speed-reading tools, machines and software programmes is developing rapidly. There has been a tremendous breakthrough in developing sophisticated machines and advanced software applications to accelerate the speed of reading and enhance the level of learners' comprehension.

However, there are inherent irreconcilable differences in the types and usages of these technological devices. Some of these software tools zoom in on either text-accelerating techniques or comprehension-enhancement strategies, while others focus on addressing the factors responsible for slow speed like subvocalization and backtracking. As a result of this multitude in the types and goals of speed-increasing tools, the reading teachers find it challenging to make the proper selection for their courses given the differences among the educational needs of their students.

The understanding of the efficacy of speed-reading tools, machines and software applications may lead to the need for developing the capacity of teachers to get familiarised with this trend of using the latest technology in education. It further necessitates the provision of training facilities to the teaching staff at all levels of education.

IX. Recommendations

In order to streamline the development of speed-reading software tools and their correct utilization, it is recommended:

- to do further research to categorize the educational objectives for the domain of speed reading.

- to establish a one-to-one relationship between different speed increasing objectives, rate-accelerating models, and technological tools and software applications.
- to train the teachers and trainers in this discipline to choose and operate these tools, machines and software.

In the current era of information technology, it is not less than a challenge for an average learner to manage a load of excessive textual information beyond his capacity by using the traditional mode of reading. It is, therefore, necessary to establish the field of hi-tech speed reading into a full-fledged academic discipline and incorporate it into the syllabus for the students of all disciplines.

It is just a conceptual paper and provided only the hypothetical framework which is constructed on the foundation of the previous works of literature. Further studies are encouraged to be conducted in additional subdomains and other affiliated domains and further explore different technological innovations.

X. Future of Speed-Reading Software

Although the progress made since the inception in the development of these tools is quite encouraging, there is still room for further improvements in making the process of speed reading less mechanical and bringing it close to the natural mode of reading.

Furthermore, as more researchers and software developing companies are attracted to this area, it can be expected that the pace of these hi-tech speed-reading innovations will continue to accelerate, and there will be many exciting and valuable new tools available in the near future.

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